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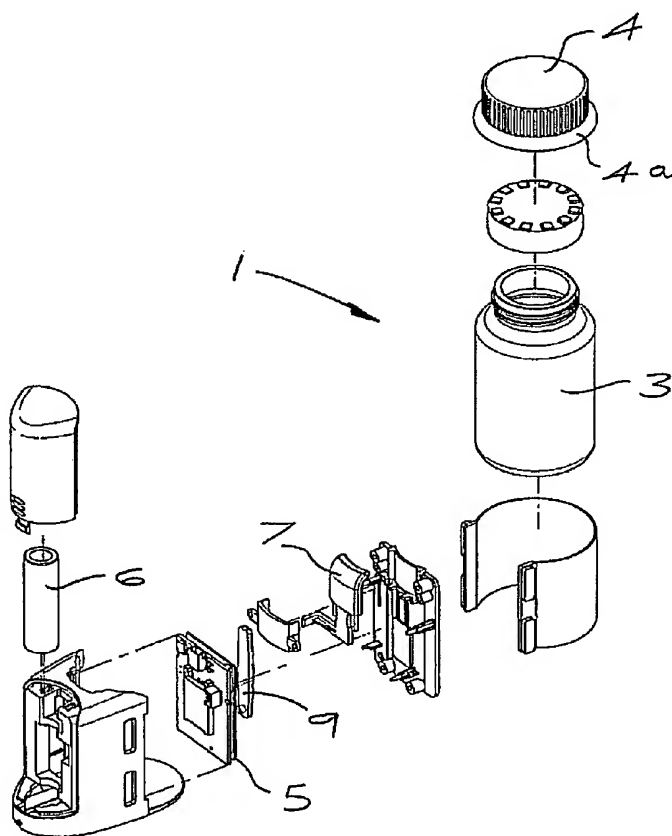
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(54) Title: MEDICATION MONITOR



(57) Abstract: A medication monitor (1) is provided that includes a body (2) that houses a removable medication container (3), a cellular telephone module (5) and a switch (7) that is activated when a lid (4) of the medication container is opened or the medication container is removed from the housing. The cellular telephone module is operable to transmit an SMS text message to a remotely accessible processor (10) when the medication container is accessed. The remotely accessible processor is associated with a store of information that includes the medication dosage schedule for the patient associated with the medication monitor. A sequence of alarms is generated if a confirmation signal is not received within a predetermined period after a scheduled dosage.



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## **MEDICATION MONITOR**

### **FIELD OF THE INVENTION**

This invention relates to a medication monitor and more specifically, to a medication monitor that monitors the medication schedule compliance of a patient.

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### **BACKGROUND TO THE INVENTION**

The effectiveness of some medication can be completely negated if a patient does not follow the prescribed dosage schedule. This problem is exacerbated in cases where patients are illiterate or elderly.

20

Various types of medication monitors are known. Devices that remind patients to take their medication in accordance with a medication schedule are disclosed in United States patents 5,657,236 and 5,850,344 to Konkright.

25

The medication monitors described in the above patents include a dispensing apparatus and a handheld communicator. The handheld communicator receives reminder signals at scheduled times from a central monitoring computer through a paging system. The user confirms receipt of the reminder by pressing a button on the handheld communicator which then returns a confirmation signal to the

30

central monitoring computer. If a confirmation signal is not received, the central monitoring computer can initiate an escalating alarm generating procedure where various parties are informed of the patient's omission. The dispensing apparatus may also communicate with the central monitoring computer through a modem to  
5 confirm actual dispensing.

These prior art patents do not teach a medication monitor that uses a cellular telephone for communication. They also do not teach a medication monitoring system in which the device in which the medication is held is portable.  
10 Furthermore, the prior art does not disclose a system where the escalating communication procedure is programmable for specific individuals or groups of individuals.

In developing countries, where the technological proficiency of, as well as the  
15 distance from and access to healthcare facilities varies greatly between individuals, a medication monitor that has a single escalating alarm generating procedure may be problematic. Also, a medication monitor that requires a user to carry a separate handheld communicator may also be unfeasible.

20 Many of the prior art systems also require that a reminder signal and a confirmation signal be transmitted each time a scheduled dosage of medicine is taken. As the network operators usually charge a fee for signals to be transmitted, this can become prohibitively expensive for lower income users.

25 There is presently a need for a robust but effective medication monitor that is suited to conditions in developing countries. In particular, such a medication monitor must be suitable for use by illiterate or substantially illiterate patients. It should also cater for different monitoring parameters for different patients or groups of patients.

**OBJECT OF THE INVENTION**

It is an object of this invention to provide a medication monitor that at least partially alleviates some of the abovementioned problems and provides at least one of the abovementioned desired advantages.

**SUMMARY OF THE INVENTION**

10 In accordance with this invention there is provided a medication monitor comprising  
a body that includes at least one medication container,  
a cellular telephone module, and  
detection means provided in the body for detecting when the medication  
15 container is accessed.

Further features of the invention provide for the medication monitor to be portable; and for the at least one medication container to be releasably receivable in the body.

20 Still further features of the invention provide for the detection means to include a sensor that detects when a lid of the or each medication container is opened; alternatively for the detection means to include a sensor that detects when the or each medication container is removed from the body.

25 Yet further features of the invention provide for the cellular telephone module to be configured to transmit a confirmation signal to a remotely accessible processor when the detection means detects that the medication container is accessed.

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A further feature of the invention provides for the confirmation signal to be a Short Message Service (SMS) text message.

5 Still further features of the invention provide for the remotely accessible processor to be coupled to a store of information; and for the store of information to include at least one medication dosage<sup>7</sup> schedule with prescribed dosage times for at least one patient.

10 Yet further features of the invention provide for the remotely accessible processor to include an alarm generating means; and for the alarm generating means to be triggered if a confirmation signal is not received within a predetermined time after a scheduled dosage time.

15 Further features of the invention provide for the alarm generating means to include a predetermined escalating sequence of alarms; and for the sequence of alarms to include the transmitting of any one or more of:

20 an alarm signal to the medication monitor;  
an alarm signal to the patient's cellular telephone;  
an alarm signal to an emergency contact person's cellular telephone;  
an alarm signal to a medical officer's cellular telephone; or  
a signal for a telephone operator to telephone the patient or to contact a medical officer or an emergency service.

25 A still further feature of the invention provides for the alarm signals to be Short Message Service (SMS) text messages.

Yet further features of the invention provide for the steps of the sequence of alarms and the time delays between them to be separately programmable for each medication monitor.

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The invention extends to a system for monitoring the medication usage of a patient comprising:

a remotely accessible processor; and

a medication monitor that has a body which includes at least one medication container, detection means and a cellular telephone module;

wherein the cellular telephone module is operable to transmit a confirmation signal to the remotely accessible processor when the detection means detects that the medication container has been accessed.

Further features of the invention provide for the detection means to include a sensor that detects when a lid of the medication container is opened; alternatively for the detection means to include a sensor that detects when the medication container is removed from the body.

A further feature of the invention provides for the confirmation signal to be a Short Message Service (SMS) text message.

The invention also extends to a method of monitoring the medication usage of a patient, the method comprising the steps of:

providing a remotely accessible processor that is coupled to a store of information which includes at least one dosage schedule that has the prescribed dosage times for at least one patient;

providing a medication monitor that includes a body that has at least one medication container, a detection means and a cellular telephone module;

signalling the remotely accessible processor, when the detection means detects that the medication container has been accessed, by transmitting a confirmation signal from the cellular telephone module;

initiating, in the event that a confirmation signal is not received by the remotely accessible processor within a predetermined time after a scheduled dosage time, an escalating sequence of alarms that includes any one or more of the steps of:

transmitting an alarm signal to the medication monitor;  
transmitting an alarm signal to the patient's cellular telephone;  
transmitting an alarm signal to an emergency contact person's  
cellular telephone;

5           transmitting an alarm signal to a medical officer's cellular telephone;  
and

          prompting a telephone operator to telephone the patient or to  
contact a medical officer or an emergency service.

10   A further feature of the invention provides for the alarm signals to be Short  
Message Service (SMS) text messages.

Still further features of the invention provide for the steps of the sequence of  
alarms and the time delays between them to be separately programmable for  
15   each medication monitor.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

20   The invention will now be described, by way of example only, with reference to  
the drawings in which:

Figure 1       is a perspective view of a medication monitor in accordance with  
the invention;

25   Figure 2       is a sectional side elevation of the medication monitor of Figure 1;

Figure 3       is an exploded perspective view of the medication monitor of Figure  
1;

Figure 4       is a schematic diagram of the medication monitor of Figure 1; and

Figure 5       is a schematic diagram of a system for monitoring the medication  
30   usage of a patient in accordance with the invention.



**DETAILED DESCRIPTION OF THE DRAWINGS**

A medication monitor (1) is shown in Figures 1 to 3. The medication monitor (1)  
5 has a body (2) that includes a medication container (3), a cellular telephone  
module (5) and detection means, in this embodiment a switch (7).

The medication container (3) is releasably receivable in the medication monitor  
body (2), has a removable lid (4) and is of a standard size and shape. The  
10 medication monitor (1) is powered by at least one electrochemical cell (6) that is  
housed within the body (2) and is portable so as to enable it to be carried on the  
person of a patient (not shown). Each medication monitor (1) is associated with  
one patient.

15 The cellular telephone module (5) includes an antenna (9) and is operable to  
transmit radio signals through a wireless communications network (8) to a  
remotely accessible processor (10), as shown in Figure 4. The remotely  
accessible processor (10) is coupled to a store of information (not shown) that  
includes the medication dosage schedule with prescribed dosage times for at  
20 least one patient.

The medication monitor (1) includes a digital clock (not shown) that controls the  
timing of the circuitry, and includes digital memory (not shown) for storing the  
contact details of the remotely accessible processor (10), identification data for  
25 the medication monitor (1) and medication history that may include the times at  
which the medication container (3) was opened. The medication monitor (1) may  
also include a communication interface port (11) for the transfer of identification  
data, application code and contact details to the digital memory.

30 In use, the switch (7) is activated when the lid (4) of the medication container (3)  
is opened or when the medication container (3) is removed from the body (2).

This can conveniently be achieved by allowing a lower most rim (4a) of the lid (4) to depress the switch (7) when the lid (4) is in the closed position and to activate the switch (7) when the lid (4) is removed. When the switch is activated the cellular telephone module (5) transmits a confirmation SMS text message to the remotely accessible processor (10) through the wireless communications network (8). The remotely accessible processor (10) records the time at which the confirmation SMS text message is received.

The medication monitor (1) may also be configured to transmit operational status information such as battery condition, signal strength and network location to the remotely accessible processor (10) via the cellular telephone module (5).

The remotely accessible processor (10) has an alarm generating means (not shown) that is configurable to generate an alarm signal if a confirmation signal is not received within a predetermined time after a scheduled dosage time.

The alarm generating means includes a predetermined escalating sequence of alarms that are controlled by an alarm generating procedure. As shown in Figure 5, the alarm generating procedure may include transmitting a first alarm signal (16) to the medication monitor (1); transmitting a second alarm signal (17) to the patient's cellular telephone (18); transmitting a third alarm signal (19) to an emergency contact person's cellular telephone (20); and transmitting a fourth alarm signal (21) to a medical officer's cellular telephone (22). Importantly, the applicable alarm signals and the timing between them are individually programmable for each medication monitor (1).

Figure 5 also shows the process of patient registration. During patient registration the medication monitor (1) may be connected to a computer at the medication dispensing point (12) by the computer interface port (11). The patient's information and the medication dispensing schedule are then communicated via the Internet (14) to the remotely accessible processor (10) together with a unique

medication monitor identifier (not shown). The steps of the alarm generating procedure and the time delays between these steps can be programmed separately for each medication monitor (1) at the time of registration depending on patient requirement. Patient registration can then be confirmed through the  
5 wireless communication network (8) by the medication monitor (1) transmitting a signal to the remotely accessible processor (10).

Once so registered, the remotely accessible processor (10) is able to associate messages, such as confirmation signals, received from the medication monitor  
10 (1) with the medication dispensing schedule of the particular patient associated with that medication monitor (1), and is also able to transmit the correct alarm signals to that medication monitor (1).

It will be appreciated that other embodiments of a medication monitor and a  
15 system for measuring the medication usage of a patient may be devised that fall within the scope of the invention. The remotely accessible processor (10) may be a single computer or a network of several computers. The communication interface to the wireless communications network (8) may be via a GSM connection or any direct server connection that allows multiple message  
20 reception from or transmission to the wireless communications network (8).

It is also envisaged that body (2) and the medication container (3) can be integrally moulded and that other mechanisms may be used to detect when the lid of the container is removed. A proximity sensor may, for example, be used for  
25 this purpose.

It will further be appreciated that the actual design of the components and the computer related systems according to this invention fall within the knowledge of those skilled in the art.

**CLAIMS**

1. A medication monitor comprising:
  - a body that includes at least one medication container;
  - 5 a cellular telephone module; and
  - detection means provided in the body for detecting when the medication container is accessed.
2. A medication monitor as claimed in claim 1 in which the medication monitor is portable.
- 10 3. A medication monitor as claimed in claim 1 or claim 2 in which the at least one medication container is releasably receivable in the body.
4. A medication monitor as claimed in any one of the preceding claims in which the detection means includes a sensor that detects when a lid of the or each medication container is opened.
- 15 5. A medication monitor as claimed in any one of claims 1 to 3 in which the detection means includes a sensor that detects when the medication container is removed from the body.
6. A medication monitor as claimed in any one of the preceding claims in which the telephone module is configured to transmit a confirmation signal to a remotely accessible processor when the detection means  
20 detects that the medication container is accessed.
7. A medication monitor as claimed in claim 6 in which the confirmation signal is a Short Message Service (SMS) text message.
8. A medication monitor as claimed in claim 6 or claim 7 in which the  
25 remotely accessible processor is coupled to a store of information that includes at least one medication dosage schedule with prescribed dosage times for at least one patient.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB2005/002809

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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